

CLAIMS

1. A cordless window blind assembly comprising:
 - a headrail having a longitudinal axis extending between first and second ends thereof;
 - a first tube rotatably mounted between the first and second ends of said headrail;
 - a first motor coupled with said first tube for driving said first tube;
 - a second tube rotatably mounted between said first tube and the second end of said headrail;
 - a second motor coupled with said second tube for driving said second tube;
 - a bottom rail suspended below said headrail;
 - an intermediate rail suspended below said headrail and positioned between said headrail and said bottom rail;
 - a window covering material extending between said intermediate rail and said bottom rail;
 - a first lift cord having an upper end secured to said first tube and a lower end secured to said intermediate rail; and
 - a second lift cord having an upper end secured to said second tube and a lower end secured to said bottom rail, wherein said intermediate rail and said bottom rail are movable independently of one another.
2. The assembly as claimed in claim 1, wherein said window covering material has an upper end attached to said intermediate rail and a lower end attached to said bottom rail.
3. The assembly as claimed in claim 2, further comprising a second window covering material extending between said intermediate rail and said headrail.

4. The assembly as claimed in claim 3, wherein said second window covering material has a different opacity than said first window covering material.

5. The assembly as claimed in claim 1, further comprising:

a first guide coupled with said headrail and adapted to direct said first lift cord through a path including a first leg extending away from said first tube, a second leg extending away from said first tube and toward said second tube, and a third leg extending away from said second tube and toward said intermediate rail; and

a second guide coupled with said headrail and adapted to direct said second lift cord through a path including a first leg extending away from said second tube, a second leg extending away from said second tube and toward said first tube, and a third leg extending away from said first tube and toward said bottom rail.

6. The assembly as claimed in claim 5, wherein the first leg of said first lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail, the second leg of said first lift cord extends in a direction generally parallel to the longitudinal axis of said headrail and the third leg of said first lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail, and

wherein the first leg of said second lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail, the second leg of said second lift cord extends in a direction generally parallel to the longitudinal axis of said headrail and the third leg of said second lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail.

7. The assembly as claimed in claim 5, further comprising an insert rail connected to an underside of said headrail, said first guide including a first cradle connected to said headrail for supporting rotation of said first tube, said first cradle being positioned between the first leg and the second leg of said first lift cord path.

8. The assembly as claimed in claim 7, wherein said insert rail includes a first eyelet, and wherein said first guide includes the first eyelet positioned between the second leg and the third leg of the path of said first lift cord.

9. The assembly as claimed in claim 8, wherein said second guide includes a second cradle connected to said headrail for supporting rotation of said second tube, said second cradle being positioned between the first leg and the second leg of the path of said second lift cord.

10. The assembly as claimed in claim 9, wherein said insert rail includes a second eyelet, and wherein said second guide includes the second eyelet positioned between the second leg and the third leg of said second lift cord path.

11. The assembly as claimed in claim 1, further comprising:

a third lift cord having an upper end secured to said first tube and a lower end secured to said intermediate rail; and

a fourth lift cord having an upper end secured to said second tube and a lower end secured to said bottom rail.

12. The assembly as claimed in claim 1, further comprising:

a first threaded support rod disposed in said headrail and being threadably coupled with an end of said first tube;

said first motor being a first spring motor disposed in said headrail and being coupled with said first tube for driving said first tube;

a second threaded support rod disposed in said headrail and being threadably coupled with an end of said second tube;

said second motor being a second spring motor disposed in said headrail and being coupled with said second tube for driving said second tube, wherein said first and second tubes traverse between the first and second ends of said headrail when being driven by said respective first and second spring motors.

13. The assembly as claimed in claim 12, further comprising a tensioning member positioned on said first threaded support rod and being engagable with the end of said first tube, said tensioning member including a compression spring positioned between two collars, wherein as said first tube is rotated, said first tube is displaced longitudinally to engage said tensioning member whereby the compression spring is compressed between said two collars.

14. A cordless window blind assembly comprising:

a headrail having a longitudinal axis extending between first and second ends thereof;

a tube rotatably mounted between the first and second ends of said headrail;

a motor coupled with said tube for driving said tube;

a bottom rail suspended below said headrail by first and second lift cords;

a window covering material extending between said headrail and said bottom rail;

a first guide connected to said headrail and being adapted to direct said first lift cord through a path including a first leg extending away from said tube, a second leg extending away from a first end of said tube and toward a second end of said tube, and a third leg extending away from said tube and toward said bottom rail; and

a second guide connected to said headrail and being adapted to direct said second lift cord through a path including a first leg extending away from said tube, a second leg extending away from the second end of said tube and toward the first end of said tube, and a third leg extending away from said tube and toward said bottom rail.

15. The assembly as claimed in claim 14, wherein said window covering material has an upper end attached to said headrail and a lower end attached to said bottom rail.

16. The assembly as claimed in claim 14, wherein the first leg of said first lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail, the second leg of said first lift cord extends in a direction generally parallel to the longitudinal axis of said headrail and the third leg of said first lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail.

17. The assembly as claimed in claim 14, wherein the first leg of said second lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail, the second leg of said second lift cord extends in a direction generally parallel to the longitudinal axis of said headrail and the third leg of said second lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail.

18. The assembly as claimed in claim 14, wherein said first lift cord is secured to said tube adjacent the first end of said tube and said second lift cord is secured to said tube adjacent the second end of said tube.

19. The assembly as claimed in claim 14, further comprising a threaded support rod disposed in said headrail adjacent one of the ends of said headrail, said threaded support rod being threadably coupled with one of the ends of said tube.

20. The assembly as claimed in claim 19, further comprising a tensioning member positioned on said first threaded support rod between the one of the ends of said headrail and said tube, said tensioning member including a compression spring positioned between two collars, wherein as said tube is rotated, said tube is displaced longitudinally to engage said tensioning member whereby the compression spring is compressed between said two collars.

21. The assembly as claimed in claim 19, wherein said motor is a spring motor disposed in said headrail and being coupled with said tube for driving said tube, wherein said tube traverses between the first and second ends of said headrail when being driven by said spring motor.

22. The assembly as claimed in claim 21, wherein said threaded support rod is disposed adjacent the first end of said headrail and is threadably coupled with the first end of said tube, and wherein said spring motor is disposed adjacent the second end of said headrail and is coupled with the second end of said tube.

23. A cordless window blind assembly comprising:
a headrail having a longitudinal axis extending between first and second ends thereof;
a first tube rotatably mounted between the first and second ends of said headrail;
a second tube rotatably mounted between said first tube and the second end of said headrail, wherein said first and second tubes rotate independently of one another;
a bottom rail suspended below said headrail by lift cords;
a window covering material extending between said headrail and said bottom rail;
said lift cords including a first lift cord having an upper end secured to said first tube and a lower end secured to said bottom rail and a second lift cord having an upper end secured to said second tube and a lower end secured to said bottom rail.

24. The assembly as claimed in claim 23, wherein said window covering material has an upper end attached to said headrail and a lower end attached to said bottom rail.

25. The assembly as claimed in claim 23, further comprising:

a third lift cord having an upper end secured to said first tube and a lower end secured to said bottom rail;
and

a fourth lift cord having an upper end secured to said second tube and a lower end secured to said bottom rail.

26. The assembly as claimed in claim 23, further comprising:

a first guide connected to said headrail and being adapted to direct said first lift cord through a path including a first leg extending away from said first tube, a second leg extending away from said first tube and toward said second tube, and a third leg extending away from said second tube and toward said bottom rail; and

a second guide connected to said headrail and being adapted to direct said second lift cord through a path including a first leg extending away from said second tube, a second leg extending away from said second tube and toward said first tube, and a third leg extending away from said first tube and toward said bottom rail.

27. The assembly as claimed in claim 23, wherein the first leg of said first lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail, the second leg of said first lift cord extends in a direction generally parallel to the longitudinal axis of said headrail and the third leg of said first lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail, and

wherein the first leg of said second lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail, the second leg of said second lift cord extends in a direction generally parallel to the longitudinal axis of said headrail and the third leg of said second lift cord extends in a direction generally perpendicular to the longitudinal axis of said headrail.

28. The window blind assembly as claimed in claim 23, wherein said first guide comprises a cradle mounted in said headrail for supporting rotation of said first tube and a cord guide attached to said window covering material, and wherein said second guide comprises a second cradle mounted in said headrail for supporting rotation of

said second tube and a second cord guide attached to said window covering material.

29. The assembly as claimed in claim 23, further comprising a third lift cord extending between said first tube and said bottom rail in a direction substantially perpendicular to the longitudinal axis of said headrail and a fourth lift cord extending between said second tube and said bottom rail in a direction substantially perpendicular to the longitudinal axis of said headrail.

30. The assembly as claimed in claim 29, wherein said third lift cord has an upper end secured to said first tube and said fourth lift cord has an upper end secured to said second tube.

31. The assembly as claimed in claim 23, further comprising:

a first threaded support rod disposed in said headrail and threadably coupled with said first tube for providing traversing movement to said first tube; and

a second threaded support rod disposed in said headrail and threadably coupled with said second tube for providing traversing movement to said second tube, wherein said first and second tubes are movable independently of one another between the first and second ends of said headrail.

32. The assembly as claimed in claim 23, wherein said first motor is a first spring motor disposed in said headrail and coupled with said first tube for driving said first tube, wherein said first tube traverses between the first and second ends of said headrail when being driven by said first spring motor; and

said second motor is a second spring motor disposed in said headrail and coupled with said second tube for driving said second tube, wherein said second tube traverses between the first and second ends of said headrail when being driven by said second spring motor.

33. The assembly as claimed in claim 32, wherein said first and second spring motors include drive gears that rotate about axes that are substantially parallel to the longitudinal axis of said headrail.

34. A window blind assembly comprising:
a headrail having a longitudinal axis extending between first and second ends thereof;
a tube rotatably mounted between the first and second ends of said headrail;
a bottom rail suspended below said headrail;
an intermediate rail suspended below said headrail and positioned between said headrail and said bottom rail;
a window covering material extending between said intermediate rail and said bottom rail;
a lift cord having an upper end secured to said tube and a lower end secured to said intermediate rail.

35. The assembly as claimed in claim 34, further comprising a second window covering material extending between said headrail and said intermediate rail.

36. The assembly as claimed in claim 35, wherein said second window covering material has a different opacity than said first window covering material.

37. The assembly as claimed in claim 34, further comprising:

a second tube rotatably mounted between said first tube and the second end of said headrail;

a second lift cord having an upper end secured to said second tube and a lower end secured to said bottom rail, wherein said first and second tubes rotate independently of one another.

38. The assembly as claimed in claim 37, further comprising:

a first guide connected with said headrail and adapted to direct said first lift cord through a path including a first leg extending away from said first tube, a second leg extending away from said first tube and toward said second tube, and a third leg extending away from said second tube and toward said intermediate rail; and

a second guide connected with said headrail and adapted to direct said second lift cord through a path including a first leg extending away from said second tube, a second leg extending away from said second tube and toward said first tube, and a third leg extending away from said first tube and toward said bottom rail.

39. The assembly as claimed in claim 37, further comprising:

a third lift cord having an upper end secured to said first tube and a lower end secured to said intermediate rail; and

a fourth lift cord having an upper end secured to said second tube and a lower end secured to said bottom rail.

40. The assembly as claimed in claim 34, wherein said window covering material has an upper end attached to said intermediate rail and a lower end attached to said bottom rail.

41. The assembly as claimed in claim 34, further comprising:

a threaded support rod disposed in said headrail and being threadably coupled with an end of said tube; and

a spring motor disposed in said headrail and being coupled with said tube for driving said tube, wherein said tube traverses between the first and second ends of said headrail when being driven by said spring motor.

42. The assembly as claimed in claim 37, further comprising:

a first threaded support rod disposed in said headrail and being threadably coupled with an end of said first tube;

a first spring motor disposed in said headrail and being coupled with said first tube for driving said first tube, wherein said first tube traverses between the first and second ends of said headrail when being driven by said first spring motor.

a second threaded support rod disposed in said headrail and being threadably coupled with an end of said second tube;

a second spring motor disposed in said headrail and being coupled with said second tube for driving said second tube, wherein second tube traverses between the first and second ends of said headrail when being driven by said second spring motor.

43. A cordless window blind assembly having a combined tilt and lift control comprising:

a headrail having a longitudinal axis extending between first and second ends thereof;

a bottom rail suspended below said headrail;

slats extending between said headrail and said bottom rail;

a motor mounted in said headrail;

a tube rotatably mounted between the first and second ends of said headrail and coupled with said motor;

a lift cord having an upper end secured to said rotatable tube and a lower end secured to said bottom rail;

a ladder tape suspended below said headrail and connected with said slats, said ladder tape including a front ladder cord extending below a front section of said headrail and a rear ladder cord extending below a rear section of said headrail, said front ladder cord entering said headrail, at least partially wrapping around said tube and exiting said headrail for connection with said rear ladder cord at a location outside said headrail, wherein lowering said bottom rail relative to said head rail causes rotation of said tube in a first direction for simultaneously unwinding said lift cord from said tube and actuating said ladder tape for rotating said slats until said slats are fully rotated whereupon said front ladder cord at least partially wrapped around said tube will slip relative to said tube as said tube continues to rotate.

44. The assembly as claimed in claim 43, wherein said motor is a spring motor.

45. The assembly as claimed in claim 43, further comprising:

a second lift cord having an upper end secured to said rotatable tube and a lower end secured to said bottom rail, said second lift cord spaced from said first lift cord; and

a second ladder tape suspended below said headrail and connected with said slats, said second ladder tape including a front ladder cord extending below a front section of said headrail and a rear ladder cord extending below a rear section of said headrail, said front ladder cord of said second ladder tape entering said headrail, at

least partially wrapping around said tube and exiting said headrail for connection with said rear ladder cord of said second ladder tape at a location outside said headrail, wherein lowering said bottom rail relative to said head rail causes rotation of said tube for simultaneously unwinding said first and second lift cords from said tube and actuating said first and second ladder tapes for rotating said slats until said slats are fully rotated whereupon said front ladder cords at least partially wrapped around said tube will slip relative to said tube as said tube continues to rotate.

46. A cordless window blind assembly having a combined tilt and lift control comprising:

- a headrail having a longitudinal axis extending between first and second ends thereof;

- a bottom rail suspended below said headrail;

- slats extending between said headrail and said bottom rail;

- a motor mounted in said headrail;

- a tube rotatably mounted between the first and second ends of said headrail and coupled with said motor;

- a lift cord having an upper end secured to said tube and a lower end secured to said bottom rail;

- a ladder tape suspended below said headrail and connected with said slats, said ladder tape including a ladder cord at least partially wound around said tube, wherein lowering said bottom rail relative to said head rail causes rotation of said tube for simultaneously unwinding said lift cord from said tube and actuating said ladder tape for rotating said slats in a first direction.

47. The assembly as claimed in claim 46, further comprising:

- a second lift cord having an upper end secured to said tube and a lower end secured to said bottom rail,

said second lift cord being spaced from said first lift cord; and

a second ladder tape suspended below said headrail and connected with said slats, said second ladder tape including a ladder cord at least partially wound around said tube, wherein lowering said bottom rail relative to said head rail causes rotation of said tube for simultaneously unwinding said first and second lift cords from said tube and actuating said ladder tapes for rotating said slats.

48. The assembly as claimed in claim 47, wherein said ladder tapes are adapted to slip relative to said tube after said slats are fully rotated and said tube continues to rotate for unwinding said lift cords.

49. The assembly as claimed in claim 46, wherein raising said bottom rail relative to said head rail causes rotation of said tube for simultaneously winding said first and second lift cords about said tube and actuating said ladder tapes for rotating said slats in a second direction opposite the first direction.